

SCREENING FOR PHYTOCHEMICALS AND ANTIMICROBIAL ACTIVITY OF AQUEOUS EXTRACT OF *FICUS RELIGIOSA* LINN

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ABSTRACT

Ficus religiosa LINN belongs to Moraceae family. It widely occurs in south india. The aqueous extract of the bark, leaves, stem and fruits of *Ficus religiosa* were screened for their phytochemical and antimicrobial activity and showed the presence of alkaloids, phenol, sugar, terpenoids, glycosides, flavonoids and tannins. The disc diffusion method was used to screen for the antimicrobial activity of the pathogens. The aqueous extract of the plant have antimicrobial activity against *Escherichia coli*, *Enterobacter aerogenes*, *Pseudomonas aeruginosa*, *Aeromonas hydrophila*, *Staphylococcus aureus*, *Streptococcus pyogenes*, *Aspergillus niger* and *Candida albicans* at various concentrations. The highest zone of inhibition (10 mm -15 mm in diameter) was observed in 100 mg/ml concentration in all tested microbes.

Keywords: Antimicrobial activity, *Ficus religiosa*, Phytochemical analysis, Aqueous extract.

INTRODUCTION

Medicinal plants continue to be an important therapeutic aid for alleviating the ailments of humankind. The search for eternal health and longevity and for remedies to relieve pain and discomfort drove early man to explore his immediate natural surroundings and led to the use of many plants, animal products, and minerals, etc. and the development of a variety of therapeutic agents. Today, there is a renewed interest in traditional medicine and an increasing demand for more drugs from plant sources. This revival of interest in plant-derived drugs is mainly due to the current widespread belief that "green medicine" is safe and more dependable than the costly synthetic drugs, many of which have adverse side effects.¹ In order to promote the use of medicinal plants as potential sources of antimicrobial compounds, it is pertinent to thoroughly investigate their composition and activity and thus validate their use.²

Ficus religiosa belongs to Moraceae family. It is native from India to south East Asia.³ Bark powder is used to treat hypoglycemic, stomatitis and aphrodisiac. Stem bark is used for the treatment of ulcers, asthma, parasympatholytic, viral infection, bacterial infection, protozoan infections, relaxant possess spasmolytic effects on smooth muscles and skin diseases. Latex has curing activity for toothache. The fruit extract have antitumor activity and is used to cure purgative and aphrodisiac.⁴

The present study was aimed to analyse the phytochemical and antimicrobial activity of aqueous extract of bark, leaves, stems and fruits of this plant.

MATERIALS AND METHODS

Plant collection and extract preparation

Ficus religiosa LINN was collected from places in and around Madurai (Dist.), Tamil Nadu. Fresh plant materials (leaves, stem, bark and fruits) were washed under running tap water, air dried for seven days in shadow and then homogenized to fine powder and stored in airtight bottles. 10 gram of fine powder was taken in clean sterile Soxhlet apparatus and extracted with 150 ml of water. After extraction the extracts were dried in hot air oven. From the solid extract was made into suitable concentrations using methanol for further analysis.

Screening for Phytochemical analysis

The aqueous extract of *Ficus religiosa* was screened for phytochemical analysis. Preliminary phytochemical screening was carried out by using the standard procedures.⁵

Antimicrobial activity⁶

The antimicrobial activity was determined by disc diffusion method. The bacterial and fungal strains were obtained from Bose Clinical

Laboratory in Madurai, Tamil Nadu. Bacterial and fungal (Eight) cultures namely *Escherichia coli*, *Enterobacter aerogenes*, *Pseudomonas aeruginosa*, *Aeromonas hydrophila*, *Staphylococcus aureus*, *Streptococcus pyogenes*, *Aspergillus niger* and *Candida albicans*, were maintained in the respective medium. The discs were prepared and a volume of 20 µl from various concentrations of the plant extracts was added into the disc. The discs were placed and the organisms were swabbed on the Muller Hinton agar (bacteria) and potato dextrose agar (fungi) plates. The assessment of the antibacterial activity was based on the measurement of the diameter of the inhibition zone formed around the disc. The effects were compared with that of the standard antibiotic tetracycline (bacteria) and nystatin (fungi) at a concentration of 5 µg/ml.

RESULTS AND DISCUSSION

Phytochemical screening of aqueous extracts of bark, leaves, stem and fruits has been summarized in Table 1. The glycosides and terpenoids were present in the all extracts. Phenol was present in bark, stem and leaves extracts. Sugar was present in stem and bark extracts. The alkaloids were present in bark extract. The flavonoids were present in fruits extract. The results are very similar to the methanol extracts of the barks of *F. religiosa* and *F. bengalensis* showed the presence of carbohydrates, flavonoids, aminoacids, steroids, saponins and tannins.⁷ Babu *et al.*, demonstrated in preliminary phytochemical screening of *F. religiosa* in bark. They show the presence tannins, saponins, flavonoids, steroids, terpenoids and cardiac glycosides.⁸ The barks of *F. religiosa* showed the presence of bergapten, bergaptonol, lanosterol, β-sitosterol, stigmasterol, lupen-3-one, β-sitosterol-d-glucoside (phytosterolin), vitamin k1.^{9,10}

Table 2 and 3 shows the results of the antibacterial activity of the extracts on the test pathogens. Normally, the zone of inhibition was increased with higher concentration of the all the extracts. The highest zone of inhibition occurred with a zone diameter of 16 mm or 15 mm at a concentration of 100 mg/ml, it is very near to positive control (i.e 16 mm zone of inhibition). At the same time the lowest zone of inhibition occur with a zone diameter of 9 mm at a concentration of 25 mg/ml. The bark extract was resistant to *Escherichia coli* at 25-100 mg/ml concentration. *Streptococcus pyogenes* was inhibited at 100 mg/ml concentration of leaves and fruit extracts. *Aeromonas hydrophila* was not sensitive to stem extract at higher concentration to low concentration. *Enterobacter aerogenes* was not inhibited by fruit extract at high concentration. The antifungal activity of *Ficus religiosa* LINN (Aqueous extract of bark, leaf stem and fruits) results are shown in table 4. The stem and fruits extracts have high inhibition activity in *Candida albicans* and *Aspergillus niger*. Moderate antifungal activity was observed in bark and leaves extract. The results were very similar to the antibacterial

activity of *F. religiosa* and *Ficus bengalensis* bark extract. This extract was tested against diarrhoeal enterotoxigenic *Escherichia coli* using disc diffusion method with 4 mg/ml of different extract. The zone of inhibition ranged from 8.00 to 14.00 mm. The results show that methanol extract has high activity compared to chloroform and aqueous extract. Hexane extract and petroleum ether extract did not show any antibacterial activity.⁷ Ethanolic extract of *F. religiosa* (leaves) have more antibacterial activity with less antifungal

activity.¹¹ The aqueous and ethanol extracts (70%) of *Ficus religiosa* is very sensitive to *Helicobacter pylori* at 500 µg/ml in all strains.¹² The chloroform extracts of *F. religiosa* showed inhibition of growth of *Salmonella typhi*, *Salmonella typhimurium* and *Proteus vulgaris* at various concentrations respectively.¹³ Aqueous extract of *F. religiosa* showed good antimicrobial activity against selected food borne pathogens. High activity was found on *B. subtilis* with about 24 mm inhibition zone.¹⁴

Table 1: Preliminary phytochemicals analysis of *Ficus religiosa* LINN (Aqueous extract)

S. No.	Phytochemicals	Plant samples			
		Leaves	Stem	Bark	Fruits
1	Sterol	-	-	-	-
2	Reducing sugar	-	-	-	-
3	Sugar	-	+	+	-
4	Alkaloids	-	-	+	-
5	Phenol	-	-	+	+
6	Flavonoids	-	-	-	+
7	Tannin	+	+	+	-
8	Saponins	-	-	-	-
9	Aminoacids	-	-	-	-
10	Glycosides	+	+	+	+
11	Terpenoids	+	+	+	+

+: present; -: absent.

Table 2: Antibacterial activity of *Ficus religiosa* LINN (Aqueous extract of bark and leaves)

S. No.	Organisms	Zone of inhibition in diameter (mm)								Control* tetracycline
		Bark				Leaves				
		1	2	3	4	1	2	3	4	
1	<i>Staphylococcus aureus</i>	14	13	12	11	15	13	12	10	16
2	<i>Streptococcus pyogenes</i>	13	12	10	09	09	-	-	-	16
3	<i>Escherichia coli</i>	-	-	-	-	15	14	13	12	16
4	<i>Aeromonas hydrophila</i>	15	14	13	10	15	14	12	10	18
5	<i>Enterobacter aerogenes</i>	16	15	14	12	14	12	10	09	18
6	<i>Pseudomonas aeruginosa</i>	13	12	11	10	14	13	12	10	18

* positive control (5 µg/ml), 1- 100 mg/ml, 2- 75 mg/ml, 3- 50 mg/ml, 4- 25 mg/ml, disc size- 5 mm (diameter)

Table 3: Antibacterial activity of *Ficus religiosa* LINN (Aqueous extract of stem and fruits)

S. No.	Organisms	Zone of inhibition in diameter (mm)								Control* tetracycline
		Stem				Fruits				
		1	2	3	4	1	2	3	4	
1	<i>Staphylococcus aureus</i>	15	14	13	12	14	12	10	09	16
2	<i>Streptococcus pyogenes</i>	15	13	12	11	07	-	-	-	16
3	<i>Escherichia coli</i>	16	14	12	11	14	12	10	09	16
4	<i>Aeromonas hydrophila</i>	-	-	-	-	13	12	11	10	18
5	<i>Enterobacter aerogenes</i>	14	13	12	10	-	-	-	-	18
6	<i>Pseudomonas aeruginosa</i>	14	12	10	09	12	11	10	09	18

* positive control (5 µg/ml), 1- 100 mg/ml, 2- 75 mg/ml, 3- 50 mg/ml, 4- 25 mg/ml, disc size- 5 mm (diameter).

Table 4: Antifungal activity of *Ficus religiosa* LINN (Aqueous extract of bark, leaves stem and fruits)

S. No.	Plant parts	Organisms	Concentrations				Control* nystatin
			1	2	3	4	
1	Bark	<i>Candida albicans</i>	11	10	09	08	16
		<i>Aspergillus niger</i>	10	09	08	07	11
2	Leaves	<i>Candida albicans</i>	12	11	10	09	16
		<i>Aspergillus niger</i>	11	10	08	07	11
3	Stem	<i>Candida albicans</i>	15	14	13	12	16
		<i>Aspergillus niger</i>	11	10	09	08	11
4	Fruits	<i>Candida albicans</i>	15	14	13	12	16
		<i>Aspergillus niger</i>	11	10	09	08	11

* positive control (5 µg/ml), 1- 100 mg/ml, 2- 75 mg/ml, 3- 50 mg/ml, 4- 25 mg/ml, disc size- 5 mm (diameter).

CONCLUSION

The work revealed that the aqueous extract of *Ficus religiosa* have potential bioactive compounds like alkaloids, glycosides, terpenoids, flavonoids, and tannins. The aqueous extract has antimicrobial activity against selected microorganisms and it is very similar to commercial antibiotics indicating which bioactive compound from the plant can be used for production of new antibiotics.

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